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ABSTRACT

This report presents the findings from the Instructional Dimensions Study (IDS). The IDS examined the relationship between selected program characteristics such as instructional setting, time, content, and individualized instructional practices, and program effectiveness. Specifically, it assessed the effects of these program characteristics on the reading and mathematical achievement of low-achieving students in the early elementary grades. The major goal of the research was to provide information on classroom processes that effectively promote learning. In general, the study's results were positive about the effectiveness of compensatory instructional programs. First graders in the sample made average gains of 12 months in reading and 11 months in mathematics in the 7-month period between fall and spring testing. Third graders gained 8 months in reading and 12 months in math. Students in the first grade gained most when they received compensatory instruction in their regular classes. The results for the third grade were mixed. Students in individualized instruction programs made substantial gains in achievement. However, individualization, as defined in this study, is effective, but not uniquely so. Students' gains were shown to be clearly related to the content and intensity of instruction received. (Author/AM)

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THE EFFECTS OF SERVICES ON STUDENT DEVELOPMENT

September 30, 1977

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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PREFACE

The Compensatory Education Study on which this report is based was requested by Congress in the 1974 Elementary and Secondary Education Amendments. The 1974 Amendments emphasize the direct responsibility of the National Institute of Education (NIE) to the Congress. The study began in February 1975 only after Congress had reviewed an official research plan submitted by NIE; it was funded with $15 million specially set aside from the Title I program appropriation. Results of the study will be reported directly to the President and to Congress.

This direct responsibility to Congress led NIE to ensure that the study could be planned and integrated within the Institute. A special staff was established to conduct the study, and it was placed in NIE's Educational Equity Group. That staff has planned and closely managed the research on which this report is based and the 35 research projects that make up the whole Compensatory Education Study.

This report was written by Joy Frechtling from data analyzed by herself and the staffs of Kirschner Associates, Education Turnkey Systems, and the Learning Research and Development Center. Special recognition is due to Peirce Hammond who helped in both writing the report and supervising the research on which the analyses are based. The report also reflects the work of Marjorie Kulash, Iris Rotberg, and Paul Hill who contributed to its integration and clarity, and Catherine Blacknall, who assisted in typing this report. Gaea Leinhardt and William Cooley of the Learning Research and Development Center, Hugh Paynor of Kirschner Associates, and Jack Sweeney of Education Turnkey Systems conducted the research. Finally, Albert Beaton of the Educational Testing Service provided useful comments on the statistical analyses and interpretations.

The work of several other people outside NIE is reflected in this report. Chairman Owen Peagler of the National Advisory Council on the Education of

Disadvantaged Children and the members and staff were generous with their time in advising on the execution of the study, as were a great number of educational agencies and associations at the Federal, state, and local levels. The staff of the U.S. Office of Education's Division for the Education of the Disadvantaged has been unfailingly open and helpful throughout the study.

Members of the NIE staff too numerous to mention have offered expert advice on research and helped select contractors. Special thanks are due Vera Brown and Tom Sticht for their suggestions and contributions to the study and to this report.

Paul Hill, Director
NIE Compensatory Education Study

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NIE Compensatory Education Study

SUMMARY

This report presents the results of the National Institute of Education (NIE) study of the effectiveness of reading and mathematics instruction provided to compensatory education students. The purpose of the study was to examine the effects of selected characteristics of these programs on student achievement. Its findings concern the relative effectiveness of pullout and mainstream instruction, the effectiveness of individualized instruction, and the importance of the content and intensity of instruction.

The programs examined were selected to exemplify certain instructional techniques. They were not special models or demonstrations, and were already operating in school districts. NIE included only programs whose characteristics would be stable during the school year. Thus, these classrooms may have been more stable than is typical of compensatory education programs.

In general, the study's results were positive about the effectiveness of compensatory instructional programs. First graders in the sample made average gains of 12 months in reading and 11 months in mathematics in the 7-month period between fall and spring testing. Third graders gained 8 months in reading and 12 months in mathematics. Other measures, such as percentile gains, were similarly positive. The gains observed in the sample exceed those reported in the most encouraging recent evaluations of compensatory instruction.

Students in the first grade gained most when they received compensatory instruction in their regular classrooms. The results for third graders were mixed. Their greatest gains in mathematics achievement occurred in pullout settings, separate from their regular classrooms, but their gains in reading were equal in both pullout and regular classroom programs.

These findings are important, given the predominant use of pullout instruction for compensatory education. According to the NIE National Survey of Compensatory

Education (NIE, 1977), in first grade, pullout instruction is provided to 64% of compensatory education students in reading and to 28% in mathematics. The results indicate the need for a careful review of the benefits and disadvantages of pullout instruction in the first grade.

Students in individualized instruction programs made substantial gains in achievement. In general, however, their gains were no higher than for students in less individualized classrooms. Thus, individualization, at least as defined for this study, is effective but not uniquely so. A more detailed analysis will be necessary to determine whether the concept of individualization should be redefined for further research, or whether some concept other than individualization is more promising.

Students' gains were clearly related to the content and intensity of instruction they received. When instruction emphasized the exact skills on which achievement gains were measured, students' gains were especially large. The amount of time spent in instruction was particularly important for students in pullout programs.

THE NIE COMPENSATORY EDUCATION STUDY

REQUEST FOR THE STUDY

The Education Amendments of 1974 (Public Law 93-380), the major education legislation of the 93d Congress, extended and changed the Elementary and Secondary Education Act (ESEA) of 1965 and extended other Federal education programs, including the Education of the Handicapped Act and the Adult Education Act, as well as the impact aid, Indian education, and emergency school aid programs.

The law also directed various Federal agencies to conduct studies and surveys so Congress might have the benefit of more up-to-date and accurate information during its future consideration of legislation to assist elementary and secondary education. Among these directives is Section 821 of the Education Amendments, which instructs the National Institute of Education (NIE) to conduct a study of compensatory education, including compensatory programs financed by States and those funded under authority of ESEA Title I.

Compensatory education includes a number of Federal and state programs in addition to ESEA Title I. The relative size, scope, and long history of Title I mark it as the most important of the compensatory education programs. To ensure adequate depth and scope for the study, NIE chose to focus most of its attention on Title I. In 1977, that title, the largest Federal education effort at the elementary and secondary level, provided over $2 billion, most of which was used to improve educational programs for low-achieving students in school districts serving children from low-income families.

Specifically, Section 821 instructs the Institute to conduct a study incorporating:

- An examination of the fundamental purposes and effectiveness of compensatory education programs

- An analysis of the ways of identifying children in greatest need of compensatory education

- An exploration of alternative ways of meeting these children's needs, including the use of written educational plans

- An examination of the feasibility, cost, and consequences of alternative ways of distributing Federal compensatory education funds

- Not more than 20 experimental programs to examine the issues above

The relevant sections of the 1974 statute authorizing the study are reproduced in Appendix A.

Section 821 also directs the Presidentially appointed National Advisory Council on the Education of Disadvantaged Children to advise the Institute on the design and execution of the study.

Finally, the law, as amended by Public Law 94-482, requires NIE to submit interim reports to the President and Congress on December 31, 1976, and on September 30, 1977, and to submit a final report in September 1978.

LEGISLATIVE BACKGROUND

The breadth of the examination of compensatory education requested of NIE, ranging from the allocation of funds to specific instructional approaches, reflects a number of concerns that figured prominently during the 1974 Congressional consideration of the extension of ESEA Title I. Among the concerns at issue were:

- The effects of altering the definition of poverty used in the Title I allocation formula

- The feasibility of using measures of student achievement rather than numbers of low-income children in the formula
- The possibility of requiring individualized programs of instruction for each student participating in a Title I program
- The merits of requiring school districts to spend as much as 85% of their Title I grants on basic skills instruction in reading and mathematics
- The relatively narrow focus of most prior efforts to evaluate the effectiveness of Title I

RESEARCH STRATEGY

Like the provisions that authorized the study, therefore, NIE's evaluation adopted a wide focus during its examination of compensatory education. Essentially, the Institute has interpreted the provisions of Section 821 as constituting two major requests from Congress. The first requires an assessment of the effectiveness of compensatory education programs in meeting their fundamental purposes; the second requires an examination of several alternatives that might improve the effectiveness of compensatory education programs.

In response to these requests, NIE developed a strategy designed to produce a complete understanding of how the Title I program operates in practice as well as how it might change if any of several alternatives were adopted. The strategy involved examination of four major areas:

- Funds allocation
- Service delivery
- Student development
- Program administration

The study defined the first three of these areas as the "fundamental purposes" of Title I. The fourth was examined to determine both how the administrative structure required to implement such a large education program promotes achievement of program purposes and how administration might be improved.

FUNDAMENTAL PURPOSES

To examine the fundamental purposes of compensatory education programs, the broad philosophical concerns that might have motivated the program's originators must be distinguished from the more concrete operational purposes that are built into the program.

The originators of compensatory education efforts, such as Title I, may have had in mind some very general objectives, including helping to eliminate poverty, contributing to the redistribution of wealth and opportunity, reforming education, and symbolizing society's commitment to helping the disadvantaged. Although it is possible to speculate about what their motivations might have been, the debates, statutes, and official legislative reports that established the program contain a specific set of fundamental purposes, which were described in some detail in the Institute's December 1976 publication, Evaluating Compensatory Education: An Interim Report on the NIE Compensatory Education Study. These purposes, clearly discernible in the statute and accompanying formal Congressional statements, are:

(1) To provide financial assistance to school districts in relation to their numbers of low-income children and, within those districts, to the schools with the greatest numbers of low-income students

(2) To fund special services for low-achieving children in the poorest schools

(3) To contribute to the cognitive, emotional, social, or physical development of participating students

These goals of Title I are consistent with one another, but each is not equally important to all Members of Congress. Congressional debates, and even the language of different parts of committee and conference reports, suggest that Members of Congress differ about the relative importance of respective purposes. Some Congressional statements imply that the purposes form a hierarchy in which Title I delivers funds and provides services only to increase children's academic achievement (making the third the most important). Other statements, however, make it clear that allocation of funds and delivery of services are important ends in themselves and might, in fact, define the practical limits of Federal action to promote the development of children.

STRATEGY FOR ASSESSING COMPENSATORY EDUCATION

Evaluation of Title I must start from the recognition that the program has several goals, and to focus exclusively on one improperly ignores the others. Evaluation must also acknowledge that Title I operates through the Federal system and that state and local governments determine what it will be in practice. Although there is only one Federal Title I program (i.e., only one basic framework of laws and policies), it operates differently in every State, in 14,000 school districts, and in countless classrooms. Thus, to understand and evaluate Title I it is necessary to consider the ways in which Federal policy interacts with the actions of States and local educational agencies (LEAs) that actually implement the program.

Early national evaluations of Title I considered only the third goal--contributing to children's development--and often rendered judgments on the efficacy of the program without accounting for the diverse ways in which LEAs had implemented it. Those evaluations overlooked some important truths about Title I: it has several objectives, and under it LEAs deliver a range of services with a variety of aims and emphases to a diverse set of beneficiaries. In contrast to earlier evaluations, therefore, NIE's strategy is designed to (1) provide clear information about what Title I is accomplishing toward achievement of each fundamental purpose and (2) examine the implications of alternative ways of organizing the efforts of the Federal, state, and local governments to achieve these purposes.

THE REPORT

This volume is one of several intended to comply with the statutory requirement that a second interim report be completed not later than September 30, 1977. It presents NIE's findings on the effects of compensatory education programs and its student development. The report describes how the NIE Compensatory Education Study formulated the research issues, describes the Instructional Dimension Study, NIE's major effort in the student development area, and reports findings and conclusions on the effects of services on children.

Five additional reports are being published on the following topics:

- The effects of using counts of low-income children in allocating funds
- The feasibility, costs, and consequences of using counts of low-achieving children in allocating Title I funds to school districts
- The effects of using student achievement to allocate funds within school districts
- Administration of compensatory education
- The services provided by Title I and other compensatory education programs

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CHAPTER I. INTRODUCTION

This report addresses one of Title I's fundamental purposes--to contribute to children's overall development. It presents the findings from the National Institute of Education's (NIE) major research in this area, the Instructional Dimensions Study (IDS).

The IDS examines the relationship between selected program characteristics--instructional setting, time, content, and individualized instructional practices--and program effectiveness. Specifically, it assesses the effects of these program characteristics on the reading and mathematics achievement of low-achieving students in the early elementary grades. The major goal of the research is to provide information on classroom processes that effectively promote learning.

NIE's approach in this research has been to study a sample of compensatory programs specially selected to include certain instructional characteristics rather than to provide a summary national evaluation of the overall effects of Title I on children's development. This approach was selected because review of summary evaluations reveals that studies attempting to show an overall Title I effect have been of limited usefulness (McLaughlin, 1977). Both conceptual and methodological problems have hampered attempts to evaluate overall program impact, and the most informative data on why programs work come from studies that are sharper and more limited.

Summary national evaluations have had several major weaknesses. First, Title I funds a variety of different instructional and support services. Early evaluations were designed as if Title I-funded services were uniform across districts and could be properly assessed using student achievement as the principal measure of effectiveness. However, this assumption collides with an important truth about Title I: it has always provided not one service, but many. For example, according to the NIE National Survey of Compensatory Education (NIE, 1977), Title I pays for food, counseling, and health programs for students. These uses of Title I funds might, in the long run,

enhance achievement. Nevertheless, immediate gains in achievement through such expenditures are unlikely, and the use of achievement tests to measure the short-term impact of such programs is inappropriate.

Second, even within an instructional area such as reading or mathematics, important program differences exist, and summary evaluations designed to assess their average effects on achievement mask the variations in effectiveness that exist across different programs. The application of a summary measure across different types of reading and mathematics programs will often show no significant increases in overall achievement or only small average benefits, even if particular programs or aspects of programs are producing superior results (Horst, 1977; Mayeske, 1976).

Third, due to limitations in available measurement instruments, measurements of growth in all areas of student development have not been possible. Although Title I funds programs intended to improve not only achievement but also the emotional and social growth of participating students, definitions of such growth are not generally accepted and broadly applicable. Measures of nonachievement outcomes have been correspondingly unsatisfactory, and no summary evaluation has been able to assess program impact adequately in these areas. This problem has not been solved. Generally accepted measures for assessing outcomes remain available only in the area of cognitive development; even in that area, some important abilities, such as creativity and independent thinking, cannot be measured adequately. Achievement outcomes, particularly in reading and mathematics, remain the only area in which adequate tested standardized measures are available for formal research. Impact in other areas, such as attitudes, can be assessed only in an exploratory fashion. Evaluations of the impact of Title I services on children are, therefore, largely limited to evaluation of the impact of selected instructional services on achievement.[1]

These factors--heterogeneity of services, heterogeneity of programs within an instructional area, and measurement limitations--led NIE to reject the strategy of conducting a summary national evaluation of Title I-funded services and, instead, to

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[1] Because, however, there is considerable interest in attitudinal outcomes, NIE did administer the Survey of School Attitudes to students participating in the present study. As summarized in Chapter IV, the data obtained were not particularly informative because the test did not discriminate well among respondents.

develop a research study intended to provide detailed information on the relationship between selected program characteristics and student performance in reading and mathematics. This report presents the results of preliminary analyses of these data.

CHAPTER II. THE INSTRUCTIONAL DIMENSIONS STUDY

The IDS was designed to examine the relationship between achievement and variations in program characteristics. The study focuses on selected reading and mathematics instructional programs delivered to first- and third-grade students and addresses the following research questions:

- Is compensatory instruction more effective in pullout or in mainstream settings?

- Do differences in classroom processes relate to student achievement? In particular, are variations in individualization and in time spent in instruction associated with variations in achievement?

The rationale for examining these questions is discussed below.

INSTRUCTIONAL SETTING

Instructional setting is a major focus of the IDS. The study examines the impact of instructional setting on program effectiveness and assesses the influence of pullout and mainstream instruction on student achievement.[1]

Compensatory services can be delivered to students in a variety of instructional settings--the regular classroom, a separate laboratory or classroom, or even a separate building. Data from the NIE nationally representative survey of Title I school districts (NIE, 1977) indicate that pullout instruction is the predominant means for delivering supplementary services to compensatory education students. Of those students

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[1] Pullout instruction is defined as supplemental instruction that is delivered to students outside the regular classroom. Mainstream instruction is supplemental instruction delivered within the regular classroom.

receiving compensatory instruction in mathematics, language arts, or reading, an average of 44% to 75% receive it outside the regular classroom.

The Title I regulations do not require schools to deliver pullout instruction; however, they do require that Title I children receive an identifiable program. School districts often find it easier to meet these requirements by implementing separate pullout programs than by providing extra services to Title I students in the regular classroom.

There is a great deal of disagreement about the effects of the pullout practice on students. Local Title I personnel are divided on whether the practice is advantageous, and Federal policymakers have expressed concern about potential loss of services to students as a result of their being pulled from the regular classroom.

At present, the arguments over the contribution of setting are based far more on logic and practical experience than on research or evaluation data. Proponents of pullout instruction feel that the educational needs of low-achieving students can be met more effectively when a separate compensatory program is provided. They argue that teachers find it difficult to focus on the special needs of low achievers when students with a wide range of achievement levels are present in the classroom. In the pullout situation, instruction and materials can be matched more readily to the skills and needs of compensatory education students.

Proponents of mainstream instruction argue that pullout practices have some serious disadvantages. For example, early studies (e.g., Glass, 1970) suggested that the pullout approach often results in de facto segregation and tracking for regular as well as compensatory instruction. Aside from such abuses to pullout programs, however, proponents cite several advantages to mainstream instruction; they include greater ease in coordinating regular and compensatory programs, cost savings, the possibility of positive peer influences, and less risk of lowering the self-esteem of compensatory education students.

Actual comparisons of achievement gains in mainstream and pullout situations are not available. Other research, including studies of ability grouping and of the effects of peer-group composition on achievement, focuses on questions indirectly

related to the pullout vs mainstream argument. This research is important as the issues examined include many of those raised in discussions of instructional setting.

Some studies suggest that ability grouping is not effective for instructing low-achieving students. On the whole, these findings refute the contention that grouping students by ability, as in pullout programs, leads to desirable outcomes in either achievement or affective development. Specifically, reviews of studies on ability grouping (Esposito, 1973; Findley and Byran, 1971; Ogletree and Ujlaki, 1971; and NEA, 1968) indicate that homogeneous ability grouping does not consistently help students achieve. Moreover, among studies showing significant effects on learning, the slight gains for high-ability students are offset by evidence of unfavorable effects on students of average and below-average ability, particularly the latter. Findings on the influence of homogeneous ability grouping on affective development are mostly unfavorable. Although the practice might build the self-esteem of children in the high-ability groups, it affects those in average and below-average ability groups unfavorably.

On the other hand, studies of peer influences do not support the claims made by proponents of mainstreaming that the socioeconomic and achievement levels of their classmates affect pupils' academic performance. The predominant finding from analyses of data files, such as Project Talent (Bowles, 1969) and the Equality of Educational Opportunity Study (Smith, 1972), is that the influence of peer-group characteristics on achievement is not strong. In a summary of research on peer-group influence, Averch (1972) concluded that evidence about the existence of such influence is not conclusive, and that it has not been possible to separate the contributions of peer influence, school resources, and student background factors. However, studies examining peer influence typically have been broad studies meant to find general national trends. In those studies, peer variables were measured at the school or district level, and the students studied were sixth graders or older. Consequently, the studies are not a convincing source of information on classroom effects in the early grades.

NIE's research was expressly designed to examine the questions that have been raised about the relative effectiveness of mainstream and pullout instruction for

compensatory education students. The study assessed achievement in these two settings, under a variety of different instructional strategies.

CLASSROOM PROCESSES

A second major focus of the IDS is on determining the effects of selected classroom processes on achievement. The processes of interest fall into two broad categories--instructional time and content and individualized instructional practices.

Instructional Time and Content

Instructional time was selected for examination because considerable research has shown that increased instructional time is associated with increased learning (Cooley and Lohnes, 1976; Carroll, 1963). Most of this research looks at relationships between time and student achievement in a very general way. Instructional time has been variously defined as length of the school year, attendance rates, or length of the schoolday. The findings nonetheless indicate that increased time is associated with increased achievement (Heyns, 1975; David 1974; Wiley and Harnischfeger, 1974).

Studies comparing the effects of different amounts of instruction in specific subject areas, such as reading and mathematics, generally support the existence of a relationship between time and achievement (Guthrie et al., 1976; Stallings and Kaskowitz, 1975; Begle, 1971; Broward County, 1971; Zahn, 1966; Jarvis, 1963). A recent large-scale study of innovative programs (Coles et al., 1976) found an association between time spent in reading instruction and achievement, but none for mathematics. Popp and Lieberman (1977), however, did not find any relationship between time and learning for supplemental reading instruction, although the relationship was strongly evident for regular reading instruction.

It is reasonable to expect that the amount of time students are allowed for instruction will affect what they learn. The amount of time available clearly limits what opportunities exist for instruction (and learning) to take place in the classroom. However, time alone is not enough to guarantee effective learning; obviously, how time is spent is also important. Research on instructional processes has only recently begun to specify precisely how the use of time affects learning. For example, Popp

and Lieberman (1977) suggest that factors such as small group size and the opportunity for more intensive instruction moderate the effects of time per se on achievement. Summarizing a series of studies directly related to the use of time, Rosenshine (1975) suggests that time is effective only when it is used for "direct" instruction, which is structured and carefully supervised by the teacher. This conclusion is consistent with previous research on successful Title I projects. The work by Wargo et al. (1972, 1971), also indicates that directly relevant instruction and high-intensity treatment were related to achievement gains.

Research on instructional content adds an additional dimension to these findings. Based on a comparison of traditional and open classrooms, Walker and Schaffarzick (1974) suggest that school programs differ considerably in content and that what is learned is clearly a function of what is taught. Further, their analyses suggest that programs are more likely to appear successful if the content of test instruments used for evaluation matches the content of the program. Although that conclusion might seem obvious, a frequent criticism of educational program evaluations is that instructional content is not considered and that the test instruments are not appropriate indices of what has actually been taught. Critics of the recent analyses of Follow Through done by Stebbins et al. (1977), for example, suggest that the apparent superiority of some models over others might be influenced by the degree of overlap between the instructional content of these programs and the content of the outcome measures used. With this in mind, the present study includes an analysis of exactly what skills the programs are designed to teach.

INDIVIDUALIZED INSTRUCTION

The Instructional Dimensions Study also examines the effectiveness of individualized instruction. The principal concern of the study is to identify features of instructional programs that are associated with relatively high achievement gains. Individualization was chosen for study due to the attention it has received from educators and the interest shown it by Congress in its consideration of Title I in 1974. In addition, evidence from past research suggests that successful compensatory reading and mathematics programs often use individualized techniques. However, the results of these studies are not entirely consistent, and programs are not reported to be uniformly effective.

A major problem in interpreting the research results is the variety of ways in which the term "individualized instruction" has been used. Programs labeled "individualized" include teaching arrangements such as tutoring and independent study; certain instructional techniques, such as individual diagnosis and pacing; and kinds of classroom organization, such as small class size or open spaces that facilitate, but do not guarantee, individualization.

Another problem is that research on individualization has provided far more descriptive than evaluative data. Thus, although there is no shortage of literature about individualized programs, most of it is focused on describing either the nature of the programs or ways to develop them.

Evaluations of the effectiveness of individualized techniques are found in two kinds of studies: assessments of educational programs and research on teacher effectiveness. Findings are not consistent, and different studies lead to dissimilar conclusions. Support for the effectiveness of individualized techniques was found in early evaluations of successful compensatory education programs. A review of exemplary projects conducted by Wargo et al. (1972, 1971) and a more recent paper by Wargo (1977) found the following features, many of which describe structured individualized programs, to be characteristic of successful Title I projects: (1) academic objectives clearly stated; (2) individual or small group instruction; (3) directly relevant instruction; (4) high-intensity treatment; (5) active parent involvement; and (6) teacher training related to program methods. Similarly, a review of compensatory program evaluations by the U.S. Office of Education (OE) (NSPRA Report, 1973) states that successful projects often include: (1) clear written objectives; (2) attention to individual needs, including individual diagnosis and prescription; (3) flexible grouping to permit frequent individual attention; and (4) structured, sequential instruction. In addition, Popp and Lieberman (1977) also found that programs using small group or individual teaching and individual prescription based on diagnostic or criterion-referenced tests are effective in teaching reading to low achievers.

Results of other recent evaluations that have looked explicitly at programs labeled "individualized" (Schoen, 1977, 1976, 1976a; Miller, 1976, 1976a) and "innovative" (Coles et al., 1976) generally yield less positive results. In these studies,

however, individualized instruction is defined in various ways, detailed descriptions of instructional practices are not available, and it is difficult to determine whether the programs being evaluated are sufficiently similar to be placed under the single label "individualized."

Some relevant findings come not from evaluations of individualized programs per se but from studies aimed primarily at identifying effective teacher behavior. These identify methods of instruction that are related to increased achievement in the early elementary grades. MacDonald (1976), Stallings and Kaskowitz (1975), Brophy and Evertson (1974), and Soar (1973) suggest that the following characteristics are associated with effective teaching: (1) instruction structured by the teacher's proceeding in small steps through the material; (2) positive feedback; (3) supervision of students' study; and (4) time actually spent on instruction. Rosenshine (1975) suggests that these characteristics comprise "direct" instruction. They are frequently included in definitions of individualized curricula that employ a structured approach to teaching.

Taken as a whole, the existing literature is hard to interpret. It is probable that differences in student populations studied as well as in characteristics of programs given the label "individualized" add considerably to the confusion.

NIE's research was designed to investigate the effectiveness of individualized techniques by examining a carefully specified set of instructional procedures. From a review of previous research a working definition of individualization was developed. It included: specific learning objectives assigned to individual children, small group or individual pacing, individual diagnosis and prescription, and alternative learning paths and sequencing for individual children.[2]

[2]It might be possible to identify individualized programs that have characteristics other than these; the findings from the IDS might not be general to such cases.

CHAPTER III. THE STUDY PLAN

The Instructional Dimensions Study was designed specifically to provide information on the effectiveness of instructional setting, the time and content of instruction, and individualization. The plan for the study was meant to maximize NIE's ability to assess the importance of those classes of variables in student achievement. That was accomplished through selection of the study sample, methods of data collection, and the plan for organizing and analyzing data.

SELECTION OF THE STUDY SAMPLE

The sample for the IDS was selected to provide wide variations in the main instructional variables of interest. Though the classrooms selected for study could therefore not be drawn at random from all Title I classrooms, care was taken to include classrooms with a range of income levels and ethnic composition similar to the national average for Title I. The classrooms were drawn from metropolitan, urban, and rural school districts in both the North and the South. The districts varied in both geographic and demographic features; they included urban, rural, and suburban schools. The size of student population served in the districts ranged from 5,000 to 240,000 and contained from 4% to 76% minorities. Districts selected for study participation had Title I enrollments ranging from 42% to 100% of their total enrollments.

To guarantee that the classrooms selected actually included the instructional processes which the study was meant to assess, classrooms were selected through a multistage process. First, a list of candidate programs was developed through contacts with state education agencies and local education agency officials and curriculum publishers and through examination of lists of exemplary programs. Visits were then made to candidate districts and schools to observe classrooms in operation and to gather more information on classroom program characteristics. Schools and classrooms were examined for the stability, as well as the content, of their programs. To ensure that the selected classrooms would actually implement the instructional

practices that they were chosen to represent, classrooms were selected only if their instructional programs had been in use for at least 1 year. Principals and teachers in charge of the selected classrooms generally had prior experience with Title I, and no major changes in the student population were expected during the school year.

This process resulted in initial selection of districts and schools in the spring of 1976. A final selection of 440 study classrooms was made in the late summer of 1976 on the basis of further information from principals and teachers and additional on-site verification. Forty classrooms were eliminated from the study during the first year of data collection.[1] Thus, the final sample consisted of 400 classrooms in 100 schools from 14 school districts.

The sampling procedures succeeded in providing a wide representation of instructional techniques, especially individualization. The study sample included classrooms that delivered instruction on one-to-one, small-group, and whole-class bases; individual sequencing and pacing was present, as was whole-class pacing; students' progress was assessed frequently in some classes and infrequently in others; and some teachers used several alternative teaching strategies while others used only one or two. Both pullout and mainstream instruction were represented. It did appear, however, that the pullout setting had a significantly greater use of many structured individualized techniques. The differences noted are quite consistent with earlier comparisons of regular and compensatory programs (NIE, 1977). Appendix B presents a summary of these comparisons.

Details on the characteristics of districts and schools participating in the total study sample ("overall sample") and the subsamples used for special analysis ("instructional process sample") are presented in Appendix C. This appendix also contains further descriptive information on these district and school demographic

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[1] Reasons for dropping classrooms included teachers choosing to drop out of the study, teacher changes, and classrooms being eliminated because more than half the children in the class scored below chance and did not, therefore, have valid test scores.

characteristics, on Title I services offered by the districts, and some comparisons between the IDS and the NIE National Survey of Compensatory Education study samples.

METHODS OF DATA COLLECTION

Descriptive Data

Interviews with principals and teachers, curricular analyses, and videotapes of classroom instruction were used to gather descriptive data on instructional programs. Teachers were interviewed in both fall and spring to ensure an accurate account of the instructional practices used throughout the year. The study also gathered data on costs associated with each of the reading and mathematics programs.

Interviews provided information on instructional characteristics and on teacher background variables. The curricular analyses provided data on selected dimensions of individualization and on instructional content. The information on content was used to assess the overlap between questions included in the Comprehensive Test of Basic Skills (CTBS), the achievement test used to measure student learning, and the curricula used in each classroom. Videotapes of classroom instruction were employed to document aspects of teacher-child interactions not easily obtained through the interview format, such as frequency of individual and small group instruction.[2]

Finally, specially designed office rosters were used to link the participation of each child in regular and supplemental instruction and to document the amount of time spent in the supplementary activities.

Outcome Measures

To assess the impact of compensatory instructional services on student achievement, reading and mathematics services were selected, for a number of

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[2]Due to cost and time constraints, not all teachers could be videotaped. Therefore, subsamples of 66% of regular classroom teachers and 80% of compensatory education teachers were included. For details on how this sample was selected see Kirschner et al. (1977).

reasons. One factor was the virtual absence of acceptable measurement instruments outside the basic skills area. Despite continuing discussion on the best way to design tests to measure broader effects of educational programs, the only practical instruments for measuring the impact of instruction are achievement tests in reading and mathematics.

Second, as indicated by the NIE National Survey of Compensatory Education (NIE 1977), reading and mathematics accounts for a major share of the Title I program effort. The survey data indicate that of all students receiving compensatory education, over 80% receive instruction that includes a reading component, and 44% receive mathematics instruction. No other instructional or noninstructional program is offered with comparable frequency.

Selection of the first and third grades stemmed from practical as well as theoretical concerns. Due to cost considerations, it was not possible to examine instruction across all grades served by the Title I program. The lower elementary grades were selected because it was believed that individualized instructional programs were more likely to be found at these early levels.

Grade 1 was selected because of the importance of assessing the effects of programs as early as possible. Grade 1 is a critical year for beginning reading; it is also the earliest grade level at which reasonable confidence can be placed in test results. Grade 3 was selected because it provides a basis of comparison at a grade level where instructional programs, especially in reading, involve considerably more complex learning tasks.

All children participating in regular and supplemental reading and mathematics programs in the IDS classrooms were given achievement tests in the fall and spring of the study year. Achievement was assessed using the CTBS, level B, form S for grade 1, and level 1, forms S (fall) and T (spring) for grade 3.[3]

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[3]Subtests used for grade 1 students were Letter Sounds; Word Recognition I; Reading Comprehension; Word Recognition II; Mathematics Concepts and Applications; and Mathematics Computation. Subtests used for Grade 3 were Reading Vocabulary, Reading Comprehension, Mathematics Computation, and Mathematics Concepts and Applications.

The fall tests were administered 2 to 3 weeks after the beginning of school. The spring tests were given after 27 to 29 weeks of instruction. For the final analyses, the scores of only those children present both at fall and spring testing were included.[4]

Organization and Analysis of Data

Data were organized and analyzed according to a plan adapted from an evaluation design developed by Cooley and Leinhardt (1975). It divides classroom processes into five types (or elements): opportunity, individualization, instructional events, motivational processes, and teacher background. Each of the five classroom processes is composed of a large number of discrete items of data, including teacher's responses to questionnaires and direct classroom observation. Every classroom in the analyses can be assigned a score on each of the five elements.

Once the study data are organized according to Cooley and Leinhardt's five elements, every classroom's score on each element can be correlated with the average achievement of the students in that class. Full analysis of the data involves a form of regression analysis called commonality analysis, which was used to assess the strength of association between all five elements--considered separately and in all possible combinations--and student achievement.

Details of the methods used to combine items of data into the five "classroom process dimensions" are provided in Appendix D and Kirschner et al. (1977).

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[4] It should be noted, however, that the results were very similar when test scores of all children tested in either fall or spring were also included.

CHAPTER IV. PRELIMINARY STUDY FINDINGS

This chapter presents preliminary analyses of achievement gains during the 1976-77 school year.[1] The findings to be discussed focus on (1) overall achievement gains made by compensatory education students in the study sample, (2) a comparison of these gains in pullout and mainstream settings, and (3) an analysis of the relationship between classroom processes, including individualization, and achievement.

OVERALL GAINS

Table 1 presents fall and spring achievement test scores for the compensatory education students in the overall study sample. The fall test scores indicate that these children were initially performing below grade level in each subject in both grades 1 and 3. As is frequently found in studies of student achievement, the compensatory education students in the third grade were farther behind their classmates than were compensatory education students in the first grade.

However, students in both grades made substantial gains between the fall and spring. First graders made an average gain of 12 months in reading and 11 months in mathematics during the 7-month period between fall and spring testing and improved their percentile ranks in the two subjects by 12 and 15 points, respectively. Third graders gained 8 months in reading and 12 in mathematics. Their percentile gains in the two subjects were 7 and 15 points, respectively.

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[1] Analyses of students' attitudes toward school revealed no significant changes from fall to spring. The lack of difference is in large part attributable to students' very high scores in the fall; thus there was very little room for improvement in scores. It is worth noting, however, that no group of students showed a less favorable attitude in spring than in fall.

TABLE 1

FALL AND SPRING ACHIEVEMENT TEST SCORES FOR COMPENSATORY EDUCATION CHILDREN IN THE IDS SAMPLE*

		Raw Score			Grade Equivalent			Percentile		
	n	Fall	Spring	Gain	Fall	Spring	Gain	Fall	Spring	Gain
Reading 1	1,355	23.8**	47.4	23.6	0.4	1.6	1.2	22	34	12
Mathematics 1	1,429	15.6***	27.3	11.7	0.4	1.5	1.1	22	37	15
Reading 3	1,406	19.7†	31.0	11.3	1.8	2.5	0.7	13	20	7
Mathematics 3	792	21.3††	36.7	15.4	1.7	2.8	1.1	5	20	15

*Approximately 10% of the compensatory education students in IDS classrooms were eliminated from this analysis because their fall test scores were above the mean for all students in the sample. A separate analysis of gain scores for those students indicates that their rates of gain were similar to the ones presented here.

**Maximum possible score = 84.

***Maximum possible score = 56.

†Maximum possible score = 85.

††Maximum possible score = 98.

These gains can be compared to standards for success suggested by David and Pelavin (1977). In work done for NIE, they summarized three criteria against which to measure the achievement gains made by compensatory education students in a school year. Their first criterion is an average achievement gain of 8 months per 10-month school year--one more than the gain of 7 months found to be typical for low-achieving children who do not receive special help.[2] A more stringent criterion is an average achievement gain of 1 month per month of the school year.[3] The third is a gain of 10 percentile points. The last is the most severe criterion, because it requires students whose initial scores are far below average to improve their ranking vis-a-vis other students of their age.[4]

The gains in the IDS sample are remarkably high, given the results of earlier evaluations of Title I. They exceed even the achievement gains reported in more recent--and more encouraging--evaluations. Mayeske (1976), for example, presented results from the Educational Testing Service (ETS) Compensatory Reading Study which indicated that students receiving compensatory education maintained their percentile rankings between the fall and spring tests. Thomas and Pelavin (1976) reported gains of 1 month per month of instruction for students in compensatory reading programs in several States.

By contrast, compensatory education students in the IDS sample met David and Pelavin's first two criteria in both reading and mathematics. Moreover, they met the third, most exacting, criterion in first- and third-grade reading and in third-grade mathematics.

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[2] This criterion is based on analyses of data collected by State Educational Agencies for their own Title I evaluations.

[3] This standard has been applied by OE to evaluate Title I programs.

[4] This standard was suggested by Research Management Corporation and is employed in one of the recently adopted OE evaluation models.

The very large gains found for children in the IDS sample might be due in part to the stability and organization of classrooms selected for the study sample. In order to guarantee that student achievement results could be clearly associated with specific aspects of instruction, NIE selected classrooms for the study only if (1) teachers and principals in the participating schools generally had prior experience in Title I, (2) the instructional processes used in the classroom had been in use for at least 1 year, and (3) a specific, defined curriculum was being used in the classrooms. The classrooms participating in the study were operating in school districts and were not laboratories or demonstrations, but they probably were better organized than the average Title I classroom.

A subsample of the first- and third-grade students from the IDS will be retested in the fall of 1977 to assess the stability of the gains reported here. Some studies (David and Pelavin, 1977; Thomas and Pelavin, 1976) have found that school year gains are not maintained through the summer. Results from fall 1977 testing of the IDS sample will provide fresh evidence on the summer dropoff issue.

COMPARISON OF GAINS IN MAINSTREAM AND PULLOUT SETTINGS

To examine the relative effectiveness of different instructional settings, the achievement gains of students receiving instruction in mainstream programs were compared with those from pullout programs. Table 2 presents the comparisons.

Results differ by grade level. First-grade students who received instruction in the mainstream setting made significantly larger gains in both reading and mathematics than those in pullout settings. In the third grade, however, these findings are reversed in mathematics, and the two settings are almost equal in reading. It appears that neither setting is consistently associated with greater instructional effectiveness.

The findings that first grade mainstream programs are more effective than pullout programs calls into question the widespread use of pullout instruction in the first year of school. The NIE National Survey of Compensatory Education found that in first grade, pullout services were delivered to 64% of the CE students receiving reading and 28% of those receiving mathematics.

TABLE 2

FALL AND SPRING ACHIEVEMENT TEST SCORES FOR COMPENSATORY EDUCATION CHILDREN RECEIVING INSTRUCTION IN PULLOUT OR MAINSTREAM SETTINGS

		Raw Score			Grade Equivalent			Percentile		
	n	Fall	Spring	Gain	Fall	Spring	Gain	Fall	Spring	Gain
Reading 1										
Mainstream	311	24.3*	51.3	27.0	0.4	1.7	1.3	23	40	17
Pullout	1,044	23.6	46.3	22.7	0.4	1.6	1.2	21	32	11
Mathematics 1										
Mainstream	1,172	15.7**	27.9	12.1	0.4	1.6	1.2	23	38	15
Pullout	257	15.6	24.4	8.8	0.4	1.4	1.0	22	25	3
Reading 3										
Mainstream	195	19.4***	29.4	10.0	1.8	2.3	.5	12	18	6
Pullout	1,211	19.8	31.2	11.4	1.9	2.5	.6	13	20	7
Mathematics 3										
Mainstream	170	20.5†	32.5	12.0	1.6	2.5	.9	5	14	9
Pullout	622	21.5	37.9	16.3	1.7	2.9	1.2	6	22	16

*Maximum possible score of 84.

**Maximum possible score of 56.

***Maximum possible score of 85.

†Maximum possible score of 98.

Moreover, there appear to be serious questions about the validity of using tests in the first weeks of grade 1 to assign children to a separate compensatory class. Of these, perhaps the most important is the fact that first grade fall test scores may reflect not only learning problems but also differences in preschool learning experiences and unfamiliarity with tests. It is therefore difficult to diagnose children's specific needs at this age, and as a result it is not clear that first grade students whose fall test scores are low need an instructional program that is distinct and separate from the regular classroom.

Finally, the cost of delivering pullout instruction appears to favor minimizing its use in the first grade where it appears to be least productive. One study by Dienemann et al. (1974) concluded that pullout is more expensive than mainstream instruction. Cost analyses conducted on the IDS data confirm Dienemann's results.[5]

Third grade pullout programs, in contrast, resulted in higher gains for mathematics and about equal gains in reading, according to the IDS data. By third grade, low-achieving children are apparently able to benefit from the intense and distinctive instruction usually delivered in pullout settings.

RELATIONSHIP BETWEEN CLASSROOM PROCESSES AND ACHIEVEMENT

This section presents the results of analyses conducted on a subsample of IDS classrooms to determine the strength of relationships between classroom processes and student achievement.[6]

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[5] Costs were not clearly related to effectiveness in the recent study. Within the range of program costs included in the study, more expensive programs were found to be more effective only for pullout reading instruction in first grade.

[6] Gain scores and pullout-mainstream comparisons were computed for compensatory education students only. However, classroom processes were analyzed for all those classrooms for which complete classroom process data were available (the instructional process sample). Some of these classrooms did not contain compensatory education students, although they all included some low-achieving students.

As discussed in Chapter II, the IDS was designed to study the separate and combined effects of five sets of classroom processes: opportunity, individualization, instructional events, motivational processes, and teacher background. None of the processes is measured by a single questionnaire item or other direct observation. Instead, a classroom's score for any one process (e.g., individualization) represents a combination of several measures. Details of the ways in which measures were combined to produce scores on each of the classroom processes are presented in Appendix D. Briefly, the five classroom processes are composed as follows:

Opportunity:	Measures of total instructional time, time spent on specific learning tasks, and overlap between instructional content and items in the spring achievement test
Individualization:	Measures of individual sequencing, pacing, and grouping practices; and matching instruction to student needs
Instructional events:	Measures of the teacher-student interaction on cognitive and managerial issues
Motivational processes:	Measures of classroom climate and incentives provided to students
Teacher background:	Measures of teacher training and experience

In natural settings, such as those examined by the IDS, several of the classroom processes of interest are often found together. For example, many classrooms with high ratings on "individualization" also have high ratings on "instructional events." In efforts to estimate the effectiveness of such processes, it can be difficult to separate the unique effect of one of them from the simultaneous effects of two or more working together. The technique used to analyze the IDS data can estimate the degree

to which the classroom processes--both separately and in combination--are related to student achievement. When used to assess the importance of any one classroom process acting alone, the analysis produces conservative, but highly reliable estimates.

Combined Effects of the Classroom Processes

When the combined effects of all five sets of classroom processes are examined, it is clear that they are strongly related to student achievement. Table 3 compares the combined effect of the five classroom processes with the effects of another variable, "initial achievement." The "initial achievement" variable is simply students' fall achievement scores; it is strongly related to students' spring achievement because students who begin the school year with high test scores tend to have high test scores at the end of the year. The fact that classroom processes account for achievement gains even when fall achievement is considered shows that what happens in the classroom does have a strong effect on student learning.

For the first grade, differences in classroom processes have statistically significant relationships to students' achievement gains in both reading and mathematics in pullout and mainstream settings. They are also more strongly related to student achievement gains than is fall achievement.

In the third grade, classroom processes are strongly related to achievement gains only for mathematics. Fall test scores are relatively more important than instructional practices for mainstream mathematics and for both pullout and mainstream reading.

These patterns complement the analysis of overall gain scores reported above. Overall gains were large for first-grade reading and for mathematics in first and third grade; they were smallest in third-grade reading.

Preliminary analyses were also conducted to examine various combinations of the classroom processes. The results are presented in Tables 4 through 7. One combination of three elements--opportunity, individualization, and instructional events--was more strongly related to achievement than any of the other combinations.

TABLE 3

VARIATIONS IN POST-TEST ACHIEVEMENT ACCOUNTED FOR BY CLASSROOM PROCESSES AND INITIAL ACHIEVEMENT FOR THE STUDY SAMPLE

	First-Grade Reading		First-Grade Mathematics	
	Regular	Pullout	Regular	Pullout*
Classroom processes	.26**	.35**	.31***	--
Initial achievement	.08**	.14**	.10**	--
In common	.13	.03	.09	--
Total variance explained	.47**	.52**	.51**	--
n	94	87	91	--

	Third-Grade Reading		Third-Grade Mathematics	
	Regular	Pullout	Regular	Pullout
Classroom processes	.07	.12	.10***	.40†
Initial achievement	.42**	.33**	.38**	.07
In common	.28	.12	.24	.23
Total variance explained	.76**	.57**	.72**	.70**
n	89	89	108	46

*Analyses were not computed for first grade mathematics pullout instruction because the sample size was inadequate.

**Significant at the .01 level.

***Significant at the .05 level.

†Significant at the .10 level.

TABLE 4

IMPACT OF CLASSROOM PROCESSES AND INITIAL ACHIEVEMENT IN FIRST-GRADE READING FOR REGULAR AND PULLOUT INSTRUCTION

	Proportion of Variance Accounted for	
	Regular (n=94)	Pullout (n=87)
Unique		
Opportunity (O)	.07*	.08*
Motivators (M)	.02	.01
Instructional events (IE)	.05	.08
Individualization (I)	.02	.03
Teacher background (TB)	.04	.03
Initial achievement (IA)	.08	.14*
Combined**		
O and IE	.02	--
O and I	.02	--
O and IA	.04	.03
I and IE	.05	--
O, I, and IA	.02	.02
O, I, and TB	--	.02
O, I, and IA	--	-.02
IE, I, and IA	--	.02
O, M, I, and TB	--	.03
O, IE, I, and TB	--	.03
Total variance explained	.47*	.52*

* Significant at the .01 level.
** Presented only for values equal to or greater than .02.

TABLE 5

IMPACT OF CLASSROOM PROCESSES AND INITIAL ACHIEVEMENT IN FIRST-GRADE MATHEMATICS FOR REGULAR* INSTRUCTION

	Proportion of Variance Accounted for (N=91)
Unique	
Opportunity (O)	.07**
Motivators (M)	.01
Instructional events (IE)	.10***
Individualization (I)	.11***
Teacher background (TB)	.02
Initial achievement (IA)	.10**
Combined†	
O and I	.03
IA	.03
IE and I	-.03
I and IA	.03
Total variance explained	.51**

*Analyses were not computed for pullout instruction because the sample size was inadequate.

**Significant at the .01 level.

***Significant at the .05 level.

†Presented only for values equal to or greater than .02.

TABLE 6

IMPACT OF CLASSROOM PROCESSES AND INITIAL ACHIEVEMENT IN THIRD-GRADE READING FOR REGULAR AND PULLOUT INSTRUCTION

	Proportion of Variance Accounted for	
	Regular (n=89)	Pullout (n=89)
Unique		
Opportunity (O)	.01	.03
Motivators (M)	.00	.01
Instructional events (IE)	.02	.02
Individualization (I)	.02	.01
Teacher background (TB)	.00	.03
Initial achievement (IA)	.42*	.33*
Combined**		
O and IE	--	.02
O and IA	.11	.03
M and IA	.03	--
IE and IA	.09	.03
O, TB, and IA	.03	--
O, IE, and IA	.04	.03
M, I, and IA	-.03	--
I, TB, and IA	.03	--
Total variance explained	.76*	.57*

*Significant at the .01 level.

**Presented only for values equal to or greater than .02.

TABLE 7

IMPACT OF CLASSROOM PROCESSES AND INITIAL ACHIEVEMENT IN THIRD-GRADE MATHEMATICS FOR REGULAR AND PULLOUT INSTRUCTION

	Proportion of Variance Accounted for	
	Regular (n=108)	Pullout (n=46)
Unique		
Opportunity (O)	.01	.00
Motivators (M)	.02	.01
Instructional events (IE)	.01	.17*
Individualization (I)	.04	.09
Teacher background (TB)	.01	.04
Initial achievement (IA)	.36**	.07
Combined* **		
O and IE	--	.02
O and IA	.10	--
M and IE	--	.04
M and I	--	.06
M and TB	--	.03
M and IA	--	.02
I and IA	.04	.08
TB and IA	.02	--
O, I, and IA	.09	.04
M, IE, and I	--	-.04
M, IE, and TB	--	-.03
M, I, and IA	--	-.03
M, TB, and IA	--	-.03
IE, I, and IA	--	.05
IE, TB, and IA	--	.03
O, I, TB, and IA	--	.05
IE, I, TB, and IA	--	-.02
O, M, IE, I, and TB	--	-.02
O, IE, I, TB, and IA	--	-.02
M, IE,I, TB, and IA	--	.02
Total variance explained	.72**	.70**

*Significant at the .05 level.

**Significant at the .01 level.

***Presented only for values equal to or greater than .02.

Unique Effects of the Classroom Processes

Although NIE analyzed each of the five sets of classroom processes to discover its unique effects, the results for only two--opportunity and individualization--are presented here. None of the others produced clearly interpretable patterns, and a full report on them must await further analysis.

Opportunity

Of the five sets of classroom processes, opportunity was the most consistently related to gains in achievement. It was significantly related to differences in both reading and mathematics achievement gains in first grade.

The classroom process called opportunity was measured by a number of separate variables, including class size, minutes per week of instruction, time students spend on tasks, and overlap between curriculum and test content. Some of these component measures are themselves strongly related to achievement gains. For all groups of students, overlap between curriculum content and test items has a strong positive relationship to achievement. The variable, minutes per week of instruction, is also positively related to achievement in the pullout setting.

The findings are consistent with previous studies that analyzed the effects of these variables.

Individualization of Instruction

A major objective of the analysis was to determine whether individualized instructional practices are more effective than other modes of instruction and, if so, to identify the most important aspects of individualization. Preliminary analysis of the IDS data shows that individualized programs are effective, but not necessarily more so than other modes of instruction. As the data show, the classroom process labeled "individualization" by itself did not have a consistent pattern of statistically significant relationships to student achievement in the IDS analysis. Thus, the average spring test scores of students in highly individualized classrooms were generally no higher than the average scores for students in the overall IDS sample. The high rates

of achievement gains reported for the compensatory education students in the IDS hold equally for students in highly individualized classrooms and for those whose instruction was less individualized.

As discussed in Chapter II, there are many possible ways of defining individualization, and this analysis has used only one. A detailed review of the data elements that comprise "individualization" and the other classroom processes indicates that it may be useful to use the IDS data in different ways--particularly by assigning some of the measures used to define "instructional events" to "individualization" instead. It is not yet possible to determine whether the concept of individualization should be redefined or whether some concept other than "individualization" is more promising. Such conclusions must await the results of the detailed analysis that NIE will conduct in the next 12 months. The findings reported here mean only that the general concept of "individualization," as defined and measured for this study, does not identify programs that are markedly superior to others in promoting student achievement gains.

APPENDIX A. SECTIONS 821 AND 150
OF PUBLIC LAW 93-380

Public Law 93-380
93rd Congress, H. R. 69
August 21, 1974

An Act

To extend and amend the Elementary and Secondary Education Act of 1965, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Education Amendments of 1974".

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Part B—Educational Studies and Surveys

STUDY OF PURPOSES AND EFFECTIVENESS OF COMPENSATORY EDUCATION PROGRAMS

SEC. 821. (a) In addition to the other authorities, responsibilities and duties conferred upon the National Institute of Education (hereinafter referred to as the "Institute") by section 405 of the General Education Provisions Act and notwithstanding the second sentence of subsection (b)(1) of such section 405, the Institute shall undertake a thorough evaluation and study of compensatory education programs, including such programs conducted by States and such programs conducted under title I of the Elementary and Secondary Education Act of 1965. Such study shall include—

(1) an examination of the fundamental purposes of such programs, and the effectiveness of such programs in attaining such purposes;

(2) an analysis of means to identify accurately the children who have the greatest need for such programs, in keeping with the fundamental purposes thereof;

(3) an analysis of the effectiveness of methods and procedures for meeting the educational needs of children, including the use of individualized written educational plans for children, and programs for training the teachers of children;

(4) an exploration of alternative methods, including the use of procedures to assess educational disadvantage, for distributing funds under such programs to States, to State educational agencies, and to local educational agencies in an equitable and efficient manner, which will accurately reflect current conditions and insure that such funds reach the areas of greatest current need and are effectively used for such areas;

(5) not more than 20 experimental programs, which shall be reasonably geographically representative, to be administered by the Institute, in cases where the Institute determines that such experimental programs are necessary to carry out the purposes of clauses (1) through (4), and the Commissioner of Education is authorized, notwithstanding any provision of title I of the Elementary and Secondary Education Act of 1965, at the request of the Institute, to approve the use of grants which educational agencies are eligible to receive under such title I (in cases where the agency eligible for such grant agrees to such use) in order to carry out such experimental programs; and

(6) findings and recommendations, including recommendations for changes in such title I or for new legislation, with respect to the matters studied under clauses (1) through (5).

(b) The National Advisory Council on the Education of Disadvantaged Children shall advise the Institute with respect to the design and execution of such study. The Commissioner of Education shall obtain and transmit to the Institute such information as it shall request with respect to programs carried on under title I of the Act.

(c) The Institute shall make an interim report to the President and to the Congress not later than December 31, 1976, and shall make a final report thereto no later than nine months after the date of submission of such interim report, on the result of its study conducted under this section. Any other provision of law, rule, or regulation to the contrary notwithstanding, such reports shall not be submitted to any review outside of the Institute before their transmittal to the Congress, but the President and the Commissioner of Education may make to the Congress such recommendations with respect to the contents of the reports as each may deem appropriate.

(d) Sums made available pursuant to section 151(i) of the Elementary and Secondary Education Act of 1965 shall be available to carry out the provisions of this section.

(e)(1) The Institute shall submit to the Congress, within one hundred and twenty days after the date of the enactment of this Act, a plan for its study to be conducted under this section. The Institute shall have such plan delivered to both Houses on the same day and to each House while it is in session. The Institute shall not commence such study until the first day after the close of the first period of thirty calendar days of continuous session of Congress after the date of the delivery of such plan to the Congress.

(2) For purposes of paragraph (1)—

(A) continuity of session is broken only by an adjournment of Congress sine die; and

(B) the days on which either House is not in session because of an adjournment of more than three days to a day certain are excluded in the computation of the thirty-day period.

*****

"ALLOCATION OF FUNDS WITHIN THE SCHOOL DISTRICT OF A LOCAL EDUCATIONAL AGENCY

"SEC. 150. (a) For any fiscal year not more than 20 local educational agencies selected for the purpose of section 821(a)(5) of the Education Amendments of 1974 may elect, with the approval of the district-wide parent advisory council which is required to be established under section 141(a)(14) of this title, to allocate funds received from payments under this title on the basis of a method or combination of methods other than the method provided under section 141(a)(1)(A). Any method selected pursuant to this section shall be so designed and administered as to be free from racial or cultural discrimination.

"(b) Any local educational agency to which this section applies shall submit such reports to the Director of the National Institute of Education at such time and in such manner as the Director may reasonably require to carry out his responsibilities under section 821(a)(5) of the Education Amendments of 1974.

APPENDIX B. DIFFERENCES BETWEEN REGULAR AND PULLOUT INSTRUCTION ON MEASURES OF INDIVIDUALIZATION

APPENDIX B. DIFFERENCES BETWEEN REGULAR AND PULLOUT INSTRUCTION ON MEASURES OF INDIVIDUALIZATION

Dimension and Measures	First-Grade Reading	Third-Grade Reading	First-Grade Mathematics	Third-Grade Mathematics
Matching by Pretests:				
Standardized tests for placement				PO*
Curriculum tests for placement			PO	PO
Teacher tests for placement				R
Placement at end of last year	R	R		R
Observation of work sample	R	R	R	
Matching by Mastery:				
Presence of curriculum-provided mastery tests	R	R		
Curriculum test used for mastery		R	PO	
Teacher test used for mastery			R	R
Review of in-class assignments to assess mastery		R		
Completion of work units used to assess mastery		R		R
Completion of work sample used to assess mastery	R		R	
Testing Practices:				
Average number of days since last mastery test			R	
Range of days since last mastery test	R	R		R
Percent correct on last mastery test			PO	
Frequency of testing			R	

APPENDIX B. (Continued)

	First-Grade Reading	Third-Grade Reading	First-Grade Mathematics	Third-Grade Mathematics
Degree to which test varies by student	PO	PO	PO	PO
Use of tests for grading	R	R		R
Use of tests to assess mastery	PO	PO	PO	PO
Use of tests for diagnosis				
Use of tests for prescription				PO
Assignments and Grouping:				
Percent of unique assignments	PO	PO	PO	PO
Degree of unique assignments	PO	PO	PO	PO
Percent time teaching entire class	R	R	R	R
Percent time teaching subgroups of 11+	R	R	R	R
Percent time teaching subgroups of 2-4	PO	PO	PO	PO
Percent time teaching one-to-one	PO	PO	PO	PO
Number of groups	R	R	R	R
Average group size	R		R	R
Frequency of regrouping	R	R	R	R
Alternative Learning Routes:				
Repeat content using different materials	PO			PO
One-to-one remediation	PO		R	
Curriculum-suggested remedial work			R	PO
Continue on, planning to come back later			PO	PO
Consult specialist			R	PO
Degree of reliance on management system		R		R

APPENDIX B. (Continued)

	First-Grade Reading	Third-Grade Reading	First-Grade Mathematics	Third-Grade Mathematics
Sequencing and Pacing:				
Clarity of sequence		PO	PO	PO
Extent to which teacher follows sequence				
Extent to which sequence varies in classroom	PO	PO		PO
Extent to which teacher creates material to improve sequence				
Presence of self-pacing	PO	PO	PO	PO

*PO indicates that the measure was reported more frequently by a teacher providing pullout instruction; "R" indicates that the measure was reported more frequently by a teacher delivering regular instruction. All comparisons are significant at the .05 level.

APPENDIX C. DISTRICT AND SCHOOL CHARACTERISTICS

APPENDIX C. DISTRICT AND SCHOOL CHARACTERISTICS

GEOGRAPHIC DISTRIBUTION

As Table C-1 shows, urban, rural, and suburban areas were included in the study; however, the sample was not geographically representative. The participating districts included two Southern States (Florida and Virginia), two Midwestern States (Michigan and Ohio), and one Middle Atlantic State (Maryland). Several regions of the country were not represented in the study (i.e., New England and regions west of the Mississippi).

SIZE

The size of student population served in the districts included in the study ranged from 5,000 to 240,000. The districts had from 10 to 248 schools.

MINORITIES

The percentage of minority students in the participating districts ranged from 4% to 76%.

INSTRUCTIONAL SERVICES

The school districts in the IDS sample use Title I funds to support a variety of instructional services, as summarized in Table C-2. For comparative purposes, similar data from the NIE National Survey of Compensatory Education (1976) are also presented.

TABLE C-1

CHARACTERISTICS OF PARTICIPATING DISTRICTS

District Identifier	Geographic Location	Urban/ Rural/ Suburban*	Total Students Served by Districts	Number of Schools Served	Percent Minority Enrollment
A	North-Central	Urban	38,000	53	56
B	North-Central	Urban	46,000	66	24
C	North-Central	Urban	29,000	58	30
D	North-Central	Urban	8,000	20	38
E	North-Central	Rural	5,000	10	17
F	North-Central	Suburban	7,000	14	4
G	North-Central	Urban	5,000	10	11
H	North-Central	Mixed**	18,000	27	4
I	Mid Atlantic	Urban	160,000	203	76
J	Mid Atlantic	Urban	12,000	19	29
K	Mid Atlantic	Urban	43,000	66	62
L	South Atlantic	Suburban	130,000	150	26
M	South Atlantic	Urban/Rural***	240,000	248	59
N	South Atlantic	Urban	91,000	113	17

*All or all but one of the participating schools judged in this category by Study Regional and Site Coordinators.

**Some schools in each category.

***Half urban and half rural schools.

TABLE C-2

PERCENTAGE OF INSTRUCTIONAL SERVICES FUNDED WHOLLY OR PARTIALLY BY TITLE I IN THE INSTRUCTIONAL DIMENSIONS STUDY AND IN ALL TITLE I DISTRICTS

	Study Districts Offering Services	Title I Districts Offering Services*
Preschool/kindergarten	71.4	38.1
General enrichment	14.3	8.5
Follow Through	7.1	3.8
Health/nutrition	35.7	1.3
Remedial reading	71.4	69.1
Mathematics	85.7	45.0
Language arts/communication skills	71.4	69.1
English as a second language	14.3	10.2
Special education/learning disabilities	21.4	7.8
Social/cultural studies	7.1	1.8
Science	7.1	1.2

*Source: NIE National Survey of Compensatory Education (1976).

Districts in the IDS sample, although concentrating on reading and mathematics, offer a variety of instructional services. A higher percentage of study districts offers each instructional service than was reported in the national survey. Data gathered on offerings of support services are consistent with this observation, with 79% of the districts in the study sample offering some support services, compared with 59% in the nationally representative sample.

TITLE I PARTICIPATION

Data were gathered to describe the selection procedures used for determining Title I participation. Both the IDS sample and the nationally representative sample used the same types of selection criteria. School eligibility and selection are determined on the basis of census data on family income, AFDC enrollment, and free lunch counts. Study eligibility and participation are determined primarily on the basis of standardized achievement test scores and teacher judgment. In the Instructional Dimensions Study, the participating school districts serve, on the average, 76% of

eligible schools and 52% of eligible students. The comparable figures for the national sample are 90% of eligible schools and 57% of eligible children. In the study sample, therefore, school districts serve a smaller percentage of eligible schools and, within these schools, a slightly smaller percentage of eligible children than school districts nationally.

SCHOOL CHARACTERISTICS

Enrollment

Table C-3 presents the distribution of enrollments in the instructional process sample schools and in the overall sample schools.

Table C-3 indicates that the great majority of the instructional process sample schools had enrollments of 250 to 750 students. The table also shows that the overall sample schools' distribution of enrollments is quite similar to that of the instructional process sample.

Minorities

Table C-4 presents the distribution of the percentage of minority students enrolled in the instructional process sample schools and in the overall sample schools.

The data show a broad range of minority enrollment proportions in both instructional process sample schools and overall sample schools. Only one school reported that no minority students were enrolled. The table shows a relatively sparse number of schools in the 51%-90% range relative to the 1%-50% range and a bulge at the 91%-100% range (five schools were reported as having 100% minority enrollments). This pattern holds for each of the samples.

Title I Rankings

Table C-5A presents the distribution of instructional process sample schools by Title I rankings in each participating district. Table C-5B presents that distribution for the overall sample schools.

TABLE C-3

DISTRIBUTION OF ENROLLMENTS OF INSTRUCTIONAL PROCESS SAMPLE SCHOOLS
AND OVERALL SAMPLE SCHOOLS

	Number of Students Enrolled						
	0-250	251-500	501-750	751-1000	1001-1500	1501-2000	2000+
Instructional process sample schools	8	35	38	6	2	0	1
Overall sample schools	10	40	40	7	2	0	1

TABLE C-4

DISTRIBUTION OF PERCENTAGE OF MINORITY STUDENTS ENROLLED IN
INSTRUCTIONAL PROCESS SAMPLE SCHOOLS
AND OVERALL SAMPLE SCHOOLS

	Percentage of Minority Students Enrolled										
	0	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Instructional process sample schools	1	13	13	7	13	11	6	2	3	5	16
Overall sample schools	1	15	14	10	13	12	6	2	3	5	19

TABLE C-5A

DISTRIBUTION OF TITLE I RANKINGS OF INSTRUCTIONAL PROCESS SAMPLE SCHOOLS BY DISTRICT

District	No. of Schools in District	No. of Schools in Sample	No. of Schools Ranked 1-5	No. of Schools Ranked 6-10	No. of Schools Ranked 11-20	No. of Schools Ranked 21-30	No. of Schools Ranked 31-40	No. of Schools Ranked Above 40
A	53	7	2	1	4	--	--	--
B	66	4	--	2	2	--	--	--
C	58	7	4	3	--	--	--	--
D	20	6	3	3	--	--	--	--
E	10	4	3	1	--	--	--	--
F	14	5	2	3	--	--	--	--
G	10	5	5	--	--	--	--	--
H	27	7	--	--	3	4	--	--
I	203	6	--	--	--	1	--	5
J	19	4	2	1	1	--	--	--
K	66	5	--	--	--	--	--	5
L	150	9	2	--	1	3	2	1
M	248	8	1	1	--	1	3	2
N	113	13	--	3	3	3	3	1
Total		90	24	18	14	12	8	14

TABLE C-5B

DISTRIBUTION OF TITLE I RANKINGS OF OVERALL STUDY SAMPLE SCHOOLS BY DISTRICT

District	No. of Schools in District	No. of Schools in Sample	No. of Schools Ranked 1-5	No. of Schools Ranked 6-10	No. of Schools Ranked 11-20	No. of Schools Ranked 21-30	No. of Schools Ranked 31-40	No. of Schools Ranked Above 40
A	53	8	2	2	4	--	--	--
B	66	4	--	2	2	--	--	--
C	58	7	4	3	--	--	--	--
D	20	7	3	3	1	--	--	--
E	10	5	4	1	--	--	--	--
F	14	7	4	3	--	--	--	--
G	10	5	5	--	--	--	--	--
H	27	7	--	--	3	4	--	--
I	203	8	--	--	--	1	--	7
J	19	4	2	1	1	--	--	--
K	66	5	--	--	--	--	--	5
L	150	9	2	--	1	3	2	1
M	248	9	1	1	--	2	3	2
N	113	15	--	3	3	4	4	1
Total		100	27	19	15	14	9	16

Both tables show that typically not all of the top-ranked Title I schools in a district were included in the sample, but that those included were usually among the most highly ranked.

Percentage of Eligible Students Receiving Services

Table C-6A presents the number and percentage of eligible students receiving services in instructional process sample schools in each participating district. Table C-6B presents those numbers and percentages for the overall sample schools.

These two tables show that instructional process sample schools serve varying proportions of eligibles, ranging from about 60% to 100%. The average percentage of eligible students receiving services is about 80%. It should be noted that eligibility definitions and criteria differ from district to district.

TABLE C-6A

PERCENTAGE OF TITLE I-ELIGIBLE STUDENTS RECEIVING SERVICES IN INSTRUCTIONAL PROCESS SAMPLE SCHOOLS COMPARED TO TOTAL NUMBER ELIGIBLE AND TOTAL ENROLLMENT

District	No. of Schools in Sample	Total Enrollment in Instructional Process Sample Schools	Total No. of Eligible Students in Instructional Process Sample Schools	Percentage of Eligible Students Receiving Services in Instructional Process Sample Schools
A	7	4,774	1,610	91
B	4	1,128	430	90
C	7	2,534	967	86
D	6	1,873	808	86
E	4	1,168	182	100
F	5	1,950	283	60
G	5	1,866	396	65
H	7	3,472	658	78
I	6	5,610	2,889	77
J	4	1,528	196	100
K	5	3,150	1,325	78
L	9	5,409	1,340	95
M	8	5,382	2,716	57
N	13	7,267	2,446	89
Total	90	47,111	16,246	80

TABLE C-6B

PERCENTAGE OF TITLE I-ELIGIBLE STUDENTS RECEIVING SERVICES IN OVERALL STUDY SAMPLE SCHOOLS COMPARED TO TOTAL NUMBER ELIGIBLE AND TOTAL ENROLLMENT

District	No. of Schools in Sample	Total Enrollment in Overall Study Sample Schools	Total No. of Eligible Students in Overall Study Sample Schools	Percentage of Eligible Students Receiving Services in Overall Study Sample Schools
A	8	5,180	1,760	88
B	4	1,128	430	90
C	7	2,534	967	86
D	7	2,294	958	83
E	5	1,416	209	100
F	7	2,522	383	64
G	5	1,866	396	65
H	7	3,472	658	78
I	8	6,410	3,541	82
J	4	1,528	196	100
K	5	3,150	1,325	78
L	9	5,409	1,340	95
M	9	6,368	3,266	63
N	15	8,454	2,723	90
Total	100	51,731	18,152	81

APPENDIX D. CLASSROOM PROCESSES: DIMENSIONS AND MEASURES

APPENDIX D. CLASSROOM PROCESSES: DIMENSIONS AND MEASURES

Dimension	Measure
	Opportunity
1. Amount of Time Available to Learn Subject Matter	a. No. of students enrolled
	b. Percentage of students present
	c. Minutes/week in subject
	d. No. of students transferring in
	e. No. of students transferring out
	f. No. of days between start of school and post-test
	g. Percentage of students on task
2. Curriculum Overlap	a. No. of items in total test overlapping with curriculum materials
	Motivators
3. Curriculum Motivators	a. Degree of interest of main published curriculum materials
	b. Degree of reliance on:
	-Basic text
	-Instructional kits
	-An instructional system
	c. No. of modes of instruction (A)
	d. No. of modes of instruction (B)
	e. Speed of correction on product

4. Interpersonal Motivators	a. Degree of peer tutoring
	b. Degree of use of games and contests
	c. Degree of self-evaluation
	d. Degree of self-management with regard to:
	-Seating
	-Working alone
	e. Degree of teacher contingent praise
	f. Degree of teacher general praise

Instructional Events

5. Management Information	a. Rate of individual management statements
	b. Rate of group management statements
	c. Rate of individual cognitive management statements
	d. Rate of group cognitive management statements
6. Cognitive Teaching to Individuals	a. Rate of individual cognitive statements
	b. Rate of group cognitive statements
	c. Rate of child-initiated responses
	d. Rate of individual child responses
	e. Ratio of cognitive to management statements
	f. Ratio of individual student cognitive contacts
	g. Rate and extent of tutoring time

7. Cognitive Teaching to Small Groups	a. Rate of small group cognitive statements
	b. Rate of small group cognitive questions
	c. Rate of small group child questions
	d. Rate of small group child responses
	e. Rate of small group cognitive contacts
	f. Rate of personal/tangential information
8. Cognitive Teaching to Whole Class	a. Rate of cognitive statements alone
	b. Rate of cognitive questions
	c. Rate of child responses
	d. Rate of lecture time
9. Interactive Behavior and Experience	a. No. of years teaching experience
	b. Rate of silences or nonverbal time
	c. Degree to which active responses are received
	d. Degree to which teacher models responses
	e. Degree to which teacher refers to earlier curricular information
	f. Degree to which teacher focuses child's attention
	g. Degree to which teacher solicits child's opinion on correctness of response
	h. Degree to which teacher interacts clearly, concisely, and accurately with students
	i. Degree to which teacher manages class effectively

9.	Interactive Behaviors and Experience (continued)	j. Degree to which child receives feedback
		k. Degree to which teacher interacts with individual students
	Individualization	
10.	Matching Students by Pretests	Placement procedures used by teacher
		a. Standardized test results
		b. Curriculum-provided tests
		c. Teacher-made tests
		d. Placement of child at end of previous year
		e. Observation of work sample
11.	Matching by Mastery	a. Presence and use of curriculum-provided method to assess mastery
		b. Use of curriculum-provided tests
		c. Use of teacher-made tests
		d. Review of in-class assignments
		e. Completion of work units
		f. Observation of work sample
		g. Conference with pupil
12.	Testing Practices	a. Average no. of days since last mastery test
		b. Percent correct on last mastery test
		c. Frequency of testing
		d. Degree to which testing varies by individual student
		e. Use of tests for grading
		f. Use of tests for assessment of mastery

12.	Testing Practices (continued)	g. Use of tests for diagnosis
		h. Use of tests for prescription
13.	Assignments and Grouping	a. Percentage of unique assignments
		b. Degree to which unique assignments are made to individual students
		c. Percent of time spent in entire class
		d. Percent of time spent in subgroups of 11 or more
		e. Percent of time spent in groups of 2 to 4
		f. Percent of time spent one-to-one
		g. No. of groups
		h. Average group size
		i. Frequency of regrouping
14.	Alternative Learning Routes	a. Repeat content using different materials
		b. Give one-to-one remedial instruction
		c. Use curriculum-suggested remedial work
		d. Continue on, planning to come back later
		e. Consult with specialist
		f. Degree of reliance on management system
15.	Sequencing	a. Clarity of sequence
		b. Extent to which teacher follows sequence
		c. Extent to which sequence varies in classroom

15.	Sequencing (continued)	d. Extent to which teacher creates supplemental materials to improve sequence
		e. Presence of self-pacing
	Teacher Background	
16.	Experience in Teaching	a. No. of years experience within a school
17.	Formal Education	a. Highest level of formal education attained
18.	Recent Training	No. of hours (during the past 3 years) in various training activities
		a. Visits or demonstrations by others in the teacher's classroom
		b. Consulting with specialists or trainers not in the classroom
		c. Videotapes of model teaching episodes
		d. Videotapes of teachers or aides themselves in teaching episodes
		e. Workshops
		f. Courses for college credit
		No. of hours (during the past 3 years) in varied content areas
		g. Introduction of new content material
		h. Utilization of instructional equipment and material
		i. Measurement, evaluation, reporting, project planning, and design
		j. General orientation to the philosophy of compensatory education, culture, and personality of educationally disadvantaged children
		k. Types of learning disabilities

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